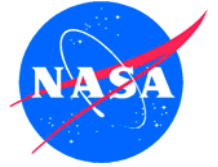


Atomic Oxygen Used to Identify Document Alteration



Independent Association of Questioned Document Examiners, Inc. (IAQDE)

TECHNOLOGY

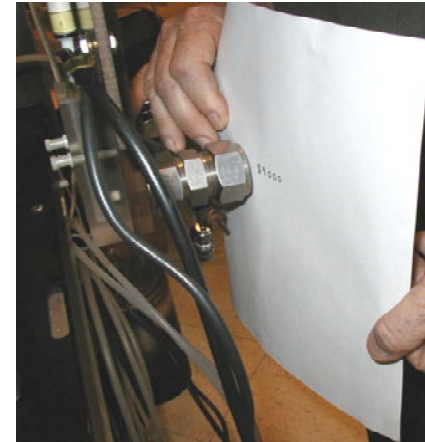
Atomic oxygen can oxidize and remove carbon and all organic materials by converting them into gasses. Thick carbon or organic layers take longer to remove than thin layers because the rate of removal is constant for atomic oxygen exposure systems. To further test the benefits of atomic oxygen interactions with materials, researchers validated the concept of using atomic oxygen to identify alteration of hand-written documents. Atomic oxygen has been found to be able to oxidize most types of ink. Testing indicates that evidence of alteration can be made visible by exposing the questionable writing to atomic oxygen.

COMMERCIAL APPLICATION

As a result of becoming familiar with the ability to oxidize hydrocarbon polymers and carbon, many spin-off applications of atomic oxygen have been discovered and validated including the use of atomic oxygen to clean soot and char off the surfaces of fire damaged paintings. In addition there are many potential biomedical applications of atomic oxygen textured surfaces.

SOCIAL / ECONOMIC BENEFIT

Forensic document examination can benefit by using atomic oxygen to identify document alteration. It has been determined that exposing sample checks from IAQDE to atomic oxygen for 12 minutes will fade ball point pen ink enough to visually distinguish the altered parts of the document from the original ink.



Sample of paper being exposed to the atmospheric atomic oxygen beam.

NASA APPLICATIONS

Atomic oxygen reacts with most spacecraft polymers causing gradual oxidative thinning. To preserve spacecraft polymers, NASA Glenn developed atomic oxygen protective coatings to prevent oxygen degradation. To validate the effectiveness of the coating NASA constructed ground facilities that produce atomic oxygen in order to create the proper testing environment. The results have proven successful as the coatings are currently used on the International Space Station.